# Aviation Investigation Final Report

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| **Location:** | Clear, Alaska | **Accident Number:** | ANC22FA047 |
| **Date & Time:** | June 26, 2022, 19:38 Local | **Registration:** | N9970F |
| **Aircraft:** | Bell UH1B | **Aircraft Damage:** | Destroyed |
| **Defining Event:** | Unknown or undetermined | **Injuries:** | 1 Fatal |
| **Flight Conducted Under:** | Part 133: Rotorcraft ext. load | | |

## Analysis

The purpose of the flight was to longline equipment to firefighters working on the ground. After a normal liftoff, the helicopter was hovering with the longline fully extended as it maneuvered to hook up to the external load. A loud “snap” or “bang” was heard, and one witness described that the helicopter “bucked.” The helicopter subsequently rolled to the right, entered a nose-low descent, and impacted the ground before bursting into flames.

A video camera captured the helicopter’s final seconds before impact with the ground. In the video recording, the helicopter is seen hovering about 140 ft above the ground as the pilot maneuvered the helicopter to hook up to the external load. During the maneuver, a loud mechanical noise occurred, and a shudder could be seen radiating through the helicopter’s fuselage, followed by an extreme roll to the right past 90°, and a nose-low descent. As the helicopter continued its descent, the transmission, with the rotor head and blades attached, and the tail boom separated from the helicopter before ground impact. The loud noise and shuddering of the helicopter suggest that a mechanical problem likely preceded the loss of control.

The sudden drop in altitude, combined with the forward pitch and right roll, enabled a mast bump condition that bent the rotor mast and caused an imbalance in the rotor system. This imbalance likely overloaded the transmission pylon structure, separating the transmission and main rotor from the rest of the airframe. The following out-of-plane divergence of the main rotor precipitated the tail boom separation.

The circumstances of the accident and motion of the helicopter during its descent are similar to the findings of a flight test in which a similar helicopter was subjected to a loss of hydraulic pressure to the main rotor flight control system. Because the factual information available was

limited, in part due to the post-crash fire and a lack of available recorded data, it could not be determined whether a loss of hydraulic pressure occurred during the accident sequence. In addition, there was no evidence of a malfunction in the hydraulic flight control servos or hydraulic pump; therefore, the reason for the loss of control could not be determined.

The pilot's medical records showed a history of cardiovascular conditions that placed him at an increased risk for a sudden cardiac event, including a heart attack or arrhythmia that could cause acute symptoms such as chest pain, shortness of breath, palpitations, or fainting; however, there were no autopsy findings to suggest that any of those occurred, and his most recent cardiologist follow-up showed him to be doing very well, asymptomatic, and tolerating his medications. His recent exercise stress test showed he had above average exercise tolerance for someone his age. Further, a witness reported that the pilot was alert and attempting to retain control of the helicopter as it descended. Therefore, it is unlikely that the pilot's cardiovascular conditions were a factor in this accident.

## Probable Cause and Findings

The National Transportation Safety Board determines the probable cause(s) of this accident to be:

A loss of control for reasons that could not be determined based on the available information.

### Findings

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| **Not determined** | (general) - Unknown/Not determined |
| **Aircraft** | Directional control - Unknown/Not determined |

# Factual Information

## History of Flight

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| **Takeoff** | Unknown or undetermined (Defining event) |

On June 26, 2022, about 1938 Alaska daylight time, a Bell UH-1B helicopter, N9970F, was destroyed when it was involved in an accident near Clear, Alaska. The pilot was fatally injured. The helicopter was operated by Northern Pioneer Helicopters LLC as a Title 14 *Code of Federal Regulations* Part 133 external load flight.

The operator reported that the helicopter was stationed at Clear Airport (Z84), Clear, Alaska, to support wildland firefighting operations. The purpose of the flight was to longline equipment to firefighters working on the ground.

Numerous witnesses reported that, after a normal liftoff, the helicopter was hovering with the longline fully extended as it maneuvered to hook up to the external load when a loud “snap” or “bang” was heard. One witness stated that the helicopter “bucked” and that he observed the pilot attempting to regain control of the helicopter as it descended. The helicopter subsequently rolled to the right, entered a nose-low descent, and impacted the ground before bursting into flames.

A witness video camera captured the helicopter’s final seconds before impact with the ground. A review of the recording revealed that that the helicopter was hovering with the 125-ft longline fully extended below the helicopter, and the hook at the end of the line was about 15 ft above the ground. As the pilot maneuvered the helicopter to hook up to the external load, a loud mechanical noise could be heard, after which a shudder is seen radiating through the helicopter’s airframe, followed by an extreme roll to the right past 90°, and a nose-low descent. As the descent continued, the transmission (with the rotor head and blades attached) along with the tail boom separated from the fuselage before ground impact. (See figure 1.)

*Figure 1 - Screen capture of the end of the video showing the separation of the main rotor and transmission from the airframe before ground impact.*

## Pilot Information

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| **Certificate:** | Commercial; Private | **Age:** | 56,Male |
| **Airplane Rating(s):** | Single-engine sea | **Seat Occupied:** | Left |
| **Other Aircraft Rating(s):** | Helicopter | **Restraint Used:** | Lap only |
| **Instrument Rating(s):** | None | **Second Pilot Present:** | |
| **Instructor Rating(s):** | None | **Toxicology Performed:** | Yes |
| **Medical Certification:** | Class 2 With waivers/limitations | **Last FAA Medical Exam:** | February 11, 2022 |
| **Occupational Pilot:** | Yes | **Last Flight Review or Equivalent:** | July 20, 2021 |
| **Flight Time:** | | | |

At his most recent Federal Aviation Administration (FAA) medical certification examination, he reported taking rosuvastatin, metoprolol, lisinopril, clopidogrel, and aspirin. He reported a 2017 heart attack with coronary artery bypass surgery of five vessels and coronary artery stenting. He was reported to have had above average exercise tolerance for his age and experienced no chest pain at his most recent stress test.

## Aircraft and Owner/Operator Information

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| **Aircraft Make:** | Bell | **Registration:** | N9970F |
| **Model/Series:** | UH1B | **Aircraft Category:** | Helicopter |
| **Year of Manufacture:** | | **Amateur Built:** | |
| **Airworthiness Certificate:** | Restricted (Special) | **Serial Number:** | 60-3568 |
| **Landing Gear Type:** | Skid | **Seats:** | 6 |
| **Date/Type of Last Inspection:** | | **Certified Max Gross Wt.:** | 8500 lbs |
| **Time Since Last Inspection:** | | **Engines:** | 1 Turbo shaft |
| **Airframe Total Time:** | | **Engine Manufacturer:** | LYCOMING |
| **ELT:** | C126 installed, not activated | **Engine Model/Series:** | T-53-L-13B |
| **Registered Owner:** | NORTHERN PIONEER HELICOPTERS LLC | **Rated Power:** | 1400 Horsepower |
| **Operator:** | NORTHERN PIONEER HELICOPTERS LLC | **Operating Certificate(s) Held:** | Rotorcraft external load (133), On-demand air taxi (135), Agricultural aircraft (137) |

The accident engine was a LycomingT53L-13B, serial number LE-18935, capable of 1,400 horsepower (hp). The engine was equipped with a five-stage axial and single stage centrifugal compressor, with an external annular combustion chamber, two-stage gas producer turbine, and two-stage power turbine.  The power shaft drives the reduction gearbox through the output shaft.

## Meteorological Information and Flight Plan

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| **Conditions at Accident Site:** | Visual (VMC) | **Condition of Light:** | Day |
| **Observation Facility, Elevation:** | PANN,361 ft msl | **Distance from Accident Site:** | 15 Nautical Miles |
| **Observation Time:** | 07:53 Local | **Direction from Accident Site:** | 3° |
| **Lowest Cloud Condition:** | | **Visibility** | 10 miles |
| **Lowest Ceiling:** | Overcast / 3700 ft AGL | **Visibility (RVR):** | |
| **Wind Speed/Gusts:** | / | **Turbulence Type Forecast/Actual:** | / |
| **Wind Direction:** | | **Turbulence Severity Forecast/Actual:** | / |
| **Altimeter Setting:** | 30.12 inches Hg | **Temperature/Dew Point:** | 16°C / 10°C |
| **Precipitation and Obscuration:** | No Obscuration; No Precipitation | | |
| **Departure Point:** | Clear, AK | **Type of Flight Plan Filed:** | Company VFR |
| **Destination:** | Clear, AK | **Type of Clearance:** | None |
| **Departure Time:** | | **Type of Airspace:** | Class G |

## Airport Information

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| **Airport:** | CLEAR Z84 | **Runway Surface Type:** | |
| **Airport Elevation:** | 559 ft msl | **Runway Surface Condition:** | Dry |
| **Runway Used:** | | **IFR Approach:** | None |
| **Runway Length/Width:** | | **VFR Approach/Landing:** | Forced landing |

## Wreckage and Impact Information

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| **Crew Injuries:** | 1 Fatal | **Aircraft Damage:** | Destroyed |
| **Passenger Injuries:** | N/A | **Aircraft Fire:** | On-ground |
| **Ground Injuries:** | | **Aircraft Explosion:** | Unknown |
| **Total Injuries:** | 1 Fatal | **Latitude, Longitude:** | 64.301207,-149.11473 |

The helicopter impacted the asphalt on the north ramp area of Z84 on its left side in a nose-low attitude and was largely consumed by postcrash fire. The engine's transmission, with the rotor head and blades still attached, was found about 30 ft from the main wreckage. (See figure 2.)

*Figure 2 - Main wreckage*

The left seat collective control was present and attached to the torque tube. Neither cyclic control was located. Both of the right seat/side anti-torque pedals had been liberated from their supports. Both left seat/side anti-torque pedals remained attached to their supports and connected to their bell crank.

The tail rotor drive system continuity was established through all of its 5 sections by accounting for the driveshaft connections, hanger bearings, and recovered drive shaft segments. The drive shafts had separated from both ends of the intermediate 42° gear box. The gear box rotated smoothly. The magnetic drain plug was removed and was free of debris.

A postaccident examination of the airframe that included, but was not limited to, the helicopter's annunciator panel, the left and right lateral servos and collective servo, the hydraulic pump, the tail rotor, and the KAFlex drive shaft revealed no pre-accident mechanical malfunctions or anomalies that would have precluded normal operation.

The NTSB Materials Laboratory examination revealed that the transmission case was fractured on the right side near the aft support. The forward pylon support legs were fractured through the rivets attaching the isolation mount pad to the vertical faces of the legs. The aft left support leg was fractured at the lower attachment bracket for the friction damper, and the aft right support leg was fractured at its lower end. The main transmission and pylon structure likely separated due to overstress fracture. The aft isolation mounts and friction dampers showed evidence of substantial overtravel in the upward direction.

The engine came to rest on its left side and exhibited significant thermal damage. A visual examination of the compressor inlet and power turbine blades did not reveal any blade damage. The postaccident examination of the engine revealed no pre-accident mechanical malfunctions or anomalies that would have precluded normal engine operation.

## Medical and Pathological Information

According to the autopsy report from the State of Alaska, State Medical Examiner's Office, Anchorage, Alaska, the pilot's cause of death was blunt force injuries of head, torso, and extremities due to helicopter crash, and the manner of death was accident. The medical examiner reported a gray-white area of the heart consistent with a remote posterior myocardial infarct, the presence of two venous grafts, and 75% stenosis of sections of his coronary arteries.

Toxicology testing performed by the FAA Forensic Sciences Laboratory detected the non-impairing medications rosuvastatin and metoprolol in the pilot's cavity blood and urine. Rosuvastatin is a member of the drug class of statins, used to treat high cholesterol and related conditions and to prevent cardiovascular disease. Metoprolol is a beta-blocker used in the treatment of hypertension and certain arrhythmias.

## Additional Information

A review of the National Transportation Safety Board (NTSB) accident database found a similar accident that involved pilot-induced oscillations caused by the loss of hydraulic assist of the flight controls due to an excessive loss of hydraulic fluid during a critical phase of flight on a Bell UH-1H helicopter (NTSB accident number CEN13FA415). The NTSB Final Report stated in part:

*Following the accident, without FAA or NTSB awareness, two pilots from Billings Flying Service conducted an informal UH-1H flight test at high altitude. The flying pilot notified the NTSB of his findings during an interview. During a simulated long line profile with the hydraulics system*

*turned off, the flying pilot observed a high amount of force was required to apply collective. While making his "hard pull" of the collective with his left arm, the pilot observed that he had a tendency to "brace" himself and push the cyclic to the right, causing a right bank. This tendency to bank right was not immediately recognized, since he was leaning left to simulate sighting for a long line operation. As he attempted to return to a level attitude (with the hydraulics system turned off) he overcorrected and entered into nearly 90 degrees of left bank. The pilot was very startled by the dramatic left bank and immediately directed the other pilot in the right seat to restore hydraulics system pressure to assist with recovery of the helicopter.*

## Administrative Information

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| **Investigator In Charge (IIC):** | Banning, David |
| **Additional Participating Persons:** | Todd Murray ; Federal Aviation Administration ; Fairbanks , AK<br>James Acher; Northern Pioneer Helicopters ; Big Lake , AK<br>Matthew Lessard; Kamatics Corporation |
| **Original Publish Date:** | July 5, 2024 |
| **Last Revision Date:** | |
| **Investigation Class:** | Class 3 |
| **Note:** | |
| **Investigation Docket:** | https://data.ntsb.gov/Docket?ProjectID=105359 |

The National Transportation Safety Board (NTSB) is an independent federal agency charged by Congress with investigating every civil aviation accident in the United States and significant events in other modes of transportation—railroad, transit, highway, marine, pipeline, and commercial space. We determine the probable causes of the accidents and events we investigate, and issue safety recommendations aimed at preventing future occurrences. In addition, we conduct transportation safety research studies and offer information and other assistance to family members and survivors for each accident or event we investigate. We also serve as the appellate authority for enforcement actions involving aviation and mariner certificates issued by the Federal Aviation Administration (FAA) and US Coast Guard, and we adjudicate appeals of civil penalty actions taken by the FAA.

The NTSB does not assign fault or blame for an accident or incident; rather, as specified by NTSB regulation, "accident/incident investigations are fact-finding proceedings with no formal issues and no adverse parties … and are not conducted for the purpose of determining the rights or liabilities of any person" (Title 49 *Code of Federal Regulations* section 831.4). Assignment of fault or legal liability is not relevant to the NTSB's statutory mission to improve transportation safety by investigating accidents and incidents and issuing safety recommendations. In addition, statutory language prohibits the admission into evidence or use of any part of an NTSB report related to an accident in a civil action for damages resulting from a matter mentioned in the report (Title 49 *United States Code* section 1154(b)). A factual report that may be admissible under 49 *United States Code* section 1154(b) is available here.